CLAIMS:

1. A method for co-modelling a packet network operating over an optical network, the method comprising the steps of;

(1) generating a basic packet capacity based on a simulated packet network comprising packet network topology information and packet traffic information and

(2) generating a basic optical capacity based on a simulated packet transport network comprising optical network topology information and the basic packet capacity.

2. A method for co-modelling a packet network operating over an optical network according to claim 1, wherein the step of generating a basic packet capacity further comprises the steps of;

(1) combining the packet network topology information in the form of a packet network topology input and the packet traffic information in the form of a packet traffic matrix input to create the simulated packet network; and

(2) assigning the simulated packet network a flow to create the basic packet capacity for the simulated packet network; and

wherein the step of generating a basic optical capacity further comprises the steps of;

(3) combining the optical network topology information in the form of an optical network topology input and the basic packet capacity to form the simulated packet transport network; and

(4) assigning the simulated packet transport network a flow to create the basic optical capacity for the simulated packet transport network.

3. A method for co-modelling a packet network operating over an optical network according to claim 2, the method further comprising the steps of;

(1) supplying the packet network topology input;

(2) supplying the packet traffic matrix input; and

(3) supplying the optical network topology input;

4. A method for co-modelling a packet network operating over an optical network according to claim 2, further comprising generating the packet network topology input, the packet traffic matrix input and the optical network topology input for use in co-modelling a packet network operating over an optical network.

5. A method for co-modelling a packet network operating over an optical network according to claim 2, wherein the packet network topology input comprises information regarding a plurality of routers in the simulated packet network, information regarding source-destination router ordered pairs in the simulated packet network, and information regarding a plurality of packet links in the simulated packet network, wherein step (2) of the method further comprising the steps of;

setting capacity to zero for all packet links;

performing a series of steps, as follows, for each source-destination router ordered pair;

A. determining a shortest packet path between routers;

B. establishing a source-destination packet traffic flow based on the shortest packet path; and

C. incrementing capacity of each packet link traversed by the packet traffic flow; and

increasing capacity of packet links per packet network engineering guidelines.

6. A method for co-modelling a packet network operating over an optical network according to claim 2, wherein the optical network topology input comprises information regarding a plurality of cross-connect switches in the simulated packet transport network and information regarding a plurality of optical links in the simulated packet transport network, wherein step (4) of the method further comprising the steps of;

setting capacity to zero for all optical links;

performing a series of steps, as follows, for each packet link between two routers;

A. determining a shortest optical path between cross-connect switches supporting the two routers;

B. establishing an optical connection to support the packet link; and

C. incrementing capacity of each optical link traversed by the optical connection; and

increasing capacity of optical links per optical network engineering guidelines.

7. A method for co-modelling a packet network operating over an optical network according to claim 5, wherein the optical network topology input comprises information regarding a plurality of cross-connect switches in the simulated packet transport network and information regarding a plurality of optical links in the simulated packet transport network, wherein step (4) of the method further comprising the steps of;

setting capacity to zero for all optical links;

performing a series of steps, as follows, for each packet link between two routers;

A. determining a shortest optical path between cross-connect switches supporting the two routers;

B. establishing an optical connection to support the packet link; and

C. incrementing capacity of each optical link traversed by the optical connection; and

increasing capacity of optical links per optical network engineering guidelines.

8. A method for co-modelling and analyzing a packet network operating over an optical network, the method comprising the steps of;

(1) generating a basic packet capacity based on a simulated packet network comprising packet network topology information and packet traffic information;

(2) generating a basic optical capacity based on a simulated packet transport network comprising optical network topology information and the basic packet capacity; and

(3) performing analysis on the simulated packet transport network.

9. A method for co-modelling and analyzing a packet network operating over an optical network according to claim 8, wherein the step of generating a basic packet capacity further comprises the steps of;

(1) combining the packet network topology information in the form of a packet network topology input and the packet traffic information in the form of a packet traffic matrix input to create the simulated packet network; and

(2) assigning the simulated packet network a flow to create the basic packet capacity for the simulated packet network; and

wherein the step of generating a basic optical capacity further comprises the steps of;

(3) combining the optical network topology information in the form of an optical network topology input and the basic packet capacity to form the simulated packet transport network; and

(4) assigning the simulated packet transport network a flow to create the basic optical capacity for the simulated packet transport network.

10. A method for co-modelling and analyzing a packet network operating over an optical network according to claim

8, wherein the step of performing analysis on the simulated packet transport network network comprises analyzing survivability of the simulated packet transport network.

11. A method for co-modelling and analyzing a packet network operating over an optical network according to claim 8, wherein the step of performing analysis on the simulated packet transport network comprises network capacity planning of the simulated packet transport network.

12. A method for co-modelling and analyzing a packet network operating over an optical network according to claim 8, wherein the step of performing analysis on the simulated packet transport network comprises performing survivability analysis, wherein an optical failure is known to occur within the simulated packet transport network, the step further comprising the steps of;

establishing at least one protection mechanism for each point-to-point connection in the simulated packet transport network;

performing a series of steps, as follows, for each optical link in the optical network;

A. switching all affected packet traffic flow to an at least one protection mechanism;

B. incrementing capacity of each optical link traversed by the at least one protection mechanism; and

C. restoring initial capacity values; and

summing capacity requirements.

13. A method for co-modelling and analyzing a packet network operating over an optical network according to claim 9, wherein the step of performing analysis on the simulated

packet transport network comprises performing survivability analysis, wherein an optical failure is known to occur within the simulated packet transport network, the step further comprising the steps of;

establishing at least one protection mechanism for each point-to-point connection in the simulated packet transport network;

performing a series of steps, as follows, for each optical link in the optical network;

A. switching all affected packet traffic flow to an at least one protection mechanism;

B. incrementing capacity of each optical link traversed by the at least one protection mechanism; and

C. restoring initial capacity values; and

summing capacity requirements.

14. A method for analyzing survivability of a simulated packet transport network comprising a packet network and an optical network, wherein the packet network is operating over the optical network, wherein an optical failure is known to occur within the simulated packet transport network and wherein packet link protection is performed in the packet network, the method comprising the steps of;

establishing at least one back-up packet traffic flow tunnel for each packet link in the simulated packet transport network;

performing a series of steps, as follows, for each optical link in the optical network;

A. taking an optical link out of service;

B. performing a series of steps, as follows, in a nested process for each packet link affected by the optical failure;

i. switching all packet traffic flow on the affected packet link to an at least one back-up packet traffic flow tunnel;

ii. incrementing capacity of each packet link traversed by the at least one back-up packet traffic flow tunnel; and

iii. incrementing capacity of each optical link traversed by an optical connection supporting the packet link; and

C. restoring initial capacity values; and

summing packet link capacity requirements and optical link capacity requirements.

15. A method for analyzing survivability of a simulated packet transport network comprising a packet network and an optical network, wherein the packet network is operating over the optical network, wherein an optical failure is known to occur within the simulated packet transport network and wherein packet link protection is performed in the optical network, the method comprising the steps of;

establishing at least one protection tunnel for each optical connection in the simulated packet transport network;

performing a series of steps, as follows, for each optical link in the optical network;

A. taking an optical link out of service;

B. switching all affected optical connections to an at least one protection tunnel;

C. incrementing capacity of each optical link traversed by the at least one protection tunnel; and

D. restoring initial capacity values; and

summing the optical link capacity requirements.

16. The method according to claim 14, wherein the packet traffic flow is LSP (Label Switch Path) traffic flow.

17. A computer useable medium having computer readable program code means for co-modelling a packet network operating over an optical network, the computer readable program code means comprising;

(1) code means for generating a basic packet capacity based on a simulated packet network comprising packet network topology information and packet traffic information; and

(2) code means for generating a basic optical capacity based on a simulated packet transport network comprising optical network topology information and the basic packet capacity.

18. A computer useable medium having computer readable program code means for co-modelling a packet network operating over an optical network according to claim 17, wherein code means for generating a basic packet capacity further comprise;

(1) combining the packet network topology information in the form of a packet network topology input

and the packet traffic information in the form of a packet traffic matrix input to create the simulated packet network; and

(2) assigning the simulated packet network a flow to create the basic packet capacity for the simulated packet network; and

wherein code means for generating a basic optical capacity further comprise;

(3) combining the optical network topology information in the form of an optical network topology input and the basic packet capacity to form the simulated packet transport network; and

(4) assigning the simulated packet transport network a flow to create the basic optical capacity for the simulated packet transport network.

19. A computer useable medium having computer readable program code means for co-modelling a packet network operating over an optical network according to claim 18, the computer readable program means further comprising;

(1) code means for receiving a packet network topology input;

(2) code means for receiving a packet traffic matrix input; and

(3) code means for receiving an optical network topology input.

20. A computer useable medium having computer readable program code means for co-modelling a packet network operating over an optical network according to claim 18, further comprising computer readable program code means for

generating the packet network topology input, the packet traffic matrix input and the optical network topology input for use in co-modelling a packet network operating over an optical network.

21. A computer useable medium having computer readable program code means for co-modelling a packet network operating over an optical network according to claim 18, wherein the packet network topology input comprises information regarding a plurality of routers in the simulated packet network, information regarding source-destination router ordered pairs in the simulated packet network, and information regarding a plurality of packet links in the simulated packet network, wherein item (2) further comprises computer readable program code means for;

setting capacity to zero for all packet links;

performing a series of steps, as follows, for each source-destination router ordered pair;

A. determining a shortest packet path between routers;

B. establishing a source-destination packet traffic flow based on the shortest packet path;

C. incrementing capacity of each packet link traversed by the packet traffic flow; and

increasing capacity of packet links per packet network engineering guidelines.

22. A computer useable medium having computer readable program code means for co-modelling a packet network operating over an optical network according to claim 18, wherein the optical network topology input comprises

information regarding a plurality of cross-connect switches in the simulated packet transport network and information regarding a plurality of optical links in the simulated packet transport network, wherein item (4) further comprises computer readable program code means for;

setting capacity to zero for all optical links;

performing a series of steps, as follows, for each packet link between two routers;

A. determining a shortest optical path between cross-connect switches supporting the two routers;

B. establishing an optical connection to support the packet link; and

C. incrementing capacity of each optical link traversed by the optical connection; and

increasing capacity of optical links per optical network engineering guidelines.

23. A computer useable medium having computer readable program code means for co-modelling a packet network operating over an optical network according to claim 21, wherein the optical network topology input comprises information regarding a plurality of cross-connect switches in the simulated packet transport network and information regarding a plurality of optical links in the simulated packet transport network, wherein item (4) further comprises computer readable program code means for;

setting capacity to zero for all optical links;

performing a series of steps, as follows, for each packet link between two routers;

A. determining a shortest optical path between cross-connect switches supporting the two routers;

B. establishing an optical connection to support the packet link; and

C. incrementing capacity of each optical link traversed by the optical connection; and

increasing capacity of optical links per optical network engineering guidelines.

24. A computer useable medium having computer readable program code means for co-modelling and analyzing a packet network operating over an optical network, the computer readable program code means comprising;

(1) code means for generating a basic packet capacity based on a simulated packet network comprising packet network topology information and packet traffic information;

(2) code means for generating a basic optical capacity based on a simulated packet transport network comprising optical network topology information and the basic packet capacity; and

(3) code means for performing analysis on the simulated packet transport network.

25. A computer useable medium having computer readable program code means for co-modelling and analyzing a packet network operating over an optical network according to claim 24, wherein code means for generating a basic packet capacity further comprise;

(1) combining the packet network topology information in the form of a packet network topology input

and the packet traffic information in the form of a packet traffic matrix input to create the simulated packet network; and

(2) assigning the simulated packet network a flow to create the basic packet capacity for the simulated packet network; and

wherein code means for generating a basic optical capacity further comprise;

(3) combining the optical network topology information in the form of an optical network topology input and the basic packet capacity to form the simulated packet transport network; and

(4) assigning the simulated packet transport network a flow to create the basic optical capacity for the simulated packet transport network.

26. A computer useable medium having computer readable program code means for co-modelling and analyzing a packet network operating over an optical network according to claim 24, wherein code means for performing analysis on the simulated packet transport network comprises code means for analyzing survivability of the simulated packet transport network.

27. A computer useable medium having computer readable program code means for co-modelling and analyzing a packet network operating over an optical network according to claim 24, wherein code means for performing analysis on the simulated packet transport network comprises code means for network capacity planning of the simulated packet transport network.

28. A computer useable medium having computer readable program code means for co-modelling and analyzing a packet network operating over an optical network according to claim 24, wherein code means for performing analysis on the simulated packet transport network comprise code means for performing survivability analysis, wherein an optical failure is known to occur within the simulated packet transport network, the code means further comprising;

code means for establishing at least one protection mechanism for each point-to-point connection in the simulated packet transport network;

code means for performing a series of steps, as follows, for each optical link in the optical network;

A. switching all affected packet traffic flow to an at least one protection mechanism;

B. incrementing capacity of each optical link traversed by the at least one protection mechanism; and

C. restoring initial capacity values; and

code means for summing capacity requirements.

29. A computer useable medium having computer readable program code means for co-modelling and analyzing a packet network operating over an optical network according to claim 25, wherein code means for performing analysis on the simulated packet transport network comprise code means for performing survivability analysis, wherein an optical failure is known to occur within the simulated packet transport network, the code means further comprising;

code means for establishing at least one protection mechanism for each point-to-point connection in the simulated packet transport network;

code means for performing a series of steps, as follows, for each optical link in the optical network;

A. switching all affected packet traffic flow to an at least one protection mechanism;

B. incrementing capacity of each optical link traversed by the at least one protection mechanism; and

C. restoring initial capacity values; and

code means for summing capacity requirements.

30. A computer useable medium having computer readable program code means for analyzing survivability of a simulated packet transport network comprising a packet network and an optical network, wherein the packet network is operating over the optical network, wherein an optical failure is known to occur within the simulated packet transport network and wherein packet link protection is performed in the packet network, the computer readable program code means comprising;

code means for establishing at least one back-up packet traffic flow tunnel for each packet link in the simulated packet transport network;

code means for performing a series of steps, as follows, for each optical link in the optical network;

A. taking an optical link out of service;

B. performing a series of steps, as follows, in a nested process for each packet link affected by the optical failure;

i. switching all packet traffic flow on the affected packet link to an at least one back-up packet traffic flow tunnel;

ii. incrementing capacity of each packet link traversed by the at least one back-up packet traffic flow tunnel; and

iii. incrementing capacity of each optical link traversed by an optical connection supporting the packet link; and

C. restoring the initial capacity values; and

code means for summing packet link capacity requirements and optical link capacity requirements.

31. A computer useable medium having computer readable program code means for analyzing survivability of a simulated packet transport network comprising a packet network and an optical network, wherein the packet network is operating over the optical network, wherein an optical failure is known to occur within the simulated packet transport network and wherein packet link protection is performed in the optical network, the computer readable program code means comprising;

code means for establishing at least one protection tunnel for each optical connection in the simulated packet transport network;

code means for performing a series of steps, as follows, for each optical link in the optical network;

A. taking an optical link out of service;

B. switching all affected optical connections to an at least one protection tunnel;

C. incrementing capacity of each optical link traversed by the at least one protection tunnel; and

D. restoring initial capacity values; and

code means for summing the optical link capacity requirements.

32. The computer useable medium having a computer readable program code means according to claim 30, wherein the packet traffic flow is LSP (Label Switch Path) traffic flow.